

## **REMARKS**

Claims 1-56 were pending in the application prior to the present amendment.

Claims 11-16 are herein cancelled.

Claims 17, 38, 43 and 51-54 are herein amended.

Thus, Claims 1-10 and 17-56 remain pending in the application.

### **Claim Objections**

Claims 1, 11, 18, 19 and 45-51 were objected to as having informalities. In particular, the Office Action states:

*As to claims 1, 11, 18, 19, 45 and 49-51 “channel spectrum estimate is usable to compute” needs to be replaced by a positive recitation, e.g., channel spectrum estimate is used to compute.*

Applicant respectfully disagrees with this objection. Claim 1 recites “wherein the channel spectrum estimate is usable to remove at least a portion of the one or more major echoes and the one or more minor echoes from the input signal”. This recitation is a positive limitation on the channel spectrum (and thus, on the claim) since it restricts the channel spectrum to the class of channel spectra that are “usable to remove ...”. Claims 49 and 50 recite similar language. Thus, claims 1, 49 and 50 overcome the stated objection.

Similarly, Claim 19 recites “wherein the channel spectrum estimate is usable to compute an estimate of an original transmission to permit recovery of information from an input signal”. Again, this recitation is a positive limitation on the channel spectrum (and thus, on the claim) since it restricts the channel spectrum to the class of channel spectra that are “usable to compute an estimate of an original transmission ...”. Claims 18 and 45 recite similar language. Thus, Claims 18, 19 and 45 overcome the stated objection.

In order to expedite the case towards an allowance, Claim 51 has been amended to recite “removing at least a portion of the one or more major echoes and the one or more minor echoes from the input signal using the channel spectrum estimate”. Thus, Claim 51

overcomes the stated objection.

### Section 112 Rejections

Claims 1-10, 12-15, 18-37 and 49-56 were rejected under 35 U.S.C. Section 112, first paragraph, as failing to comply with the enablement requirement. In particular, the Office Action states that "... applicant fails to disclose definitions for major and minor echoes in a way to enable one skilled in the art to distinguish between the two." Applicant respectfully disagrees. A major echo is an echo that is strong enough to exceed a peak detection threshold in a cross-correlation based analysis. This definition is clearly supported in the specification at least in the following passages: page 16, lines 15-16; page 18, lines 13-16; page 19, lines 16-20; and page 22, lines 19-23. A minor echo is an echo that is not strong enough to exceed the peak detection threshold of the cross-correlation based analysis, and thus, an echo which must be identified by other means. This definition is clearly supported in the specification at least at page 36, lines 1-2 and at page 37, lines 8-9. Thus, one of ordinary skill in the art would not fail to understand what Applicant means by "major echoes" and "minor echoes".

Claims 1-10, 12-15, 18-37 and 49-56 were also rejected under 35 U.S.C. Section 112, first paragraph as failing to disclose "how the number of major and minor echoes have been counted in a way to enable one skilled in the art to use the same method." Since none of the Applicant's claims explicitly recite "counting" major or minor echoes, it is not clear what features in the rejected claims the Examiner is referring to. Applicant respectfully requests clarification.

Claim 29 was rejected under 35 U.S.C. Section 112, first paragraph as failing to comply with the enablement requirement. In particular, the Office Action states "... applicant fails to disclose U and V in the specification". Applicant respectfully disagrees. Applicant notes that the language of Claim 29 is itself enabling to one of ordinary skill in the art. The right-hand sides of the expressions involving U and V are themselves explicit and enabling definitions of U and V.

Claim 3 was rejected under 35 U.S.C. Section 112, first paragraph as failing to comply

with the enablement requirement. In particular, the Office Action states:

“As to claim 3, Applicant in the invention’s disclosure describes (see page 18, lines 11 and 12) that the autocorrelation block 204 performs a frequency domain autocorrelation operation on the signal spectrum to obtain a power spectrum. Therefore, it is not clear how the autocorrelation function is computed from the filtered power spectrum as cited in claim 3.”

Applicant respectfully disagrees. It is a basic and well-recognized mathematical fact that the autocorrelation function is the inverse Fourier transform of the power spectrum. Furthermore, the specification clearly enables the computation of the “filtered autocorrelation function”, as recited in claim 3, at least at page 21, lines 25-27:

The inverse transform module 208A may perform an inverse transform on an averaged power spectrum from the stream  $S_6$  approximately once per time constant of the recursive filter. The inverse transform generates an averaged autocorrelation signal.

Claim 51 was rejected under 35 U.S.C. Section 112, second paragraph, as being indefinite. In particular, the Office Action states that:

As to claim 51, applicant claims “a memory medium comprising program instructions”, however there are no instructions given in the body of the claim, therefore the claims is vague.

While the Applicant respectfully disagrees with this rejection, Applicant has amended Claim 51, in order to expedite the Claim towards allowance, to read:

A computer-readable memory medium ~~comprising~~ storing program instructions for estimating a channel spectrum, wherein the program instructions are executable to implement: ....

Thus, the 112 rejection of Claim 51 is rendered moot.

Claim 53 was rejected under 35 U.S.C. Section 112, second paragraph, as being indefinite. While the Applicant respectfully disagrees with this rejection, Applicant has amended Claim 53, in order to expedite the Claim towards allowance.

## Section 101 Rejections

Claims 38-44 were rejected under 35 U.S.C. Section 101 as being directed to non-statutory subject matter. Applicant respectfully disagrees with this rejection. However, Applicant has amended claim 38 in order to expedite the case towards an allowance. In particular, amended Claim 38 recites: “removing at least a portion of the set of echoes from the input signal, using the revised channel spectrum, in order to obtain an output signal.” Thus, the 101 rejection of Claims 38-44 is rendered moot.

Claim 51 was rejected under 35 U.S.C. Section 101 as being directed to non-statutory subject matter. Applicant respectfully disagrees with this rejection. However, in order to expedite the case towards allowance, Claim 51 has been amended to recite:

A computer-readable memory medium ~~comprising~~ storing program instructions for estimating a channel spectrum, wherein the program instructions are executable to implement: ... removing at least a portion of the one or more major echoes and the one or more minor echoes from the input signal using the channel spectrum estimate.”

Thus, the 101 rejection of Claim 51 is rendered moot.

Claims 52-56 were rejected under 35 U.S.C. Section 101 as being directed to non-statutory subject matter. Applicant respectfully disagrees with these rejections. However, Applicant has amended Claims 52 and 54 in order to expedite the case towards an allowance. Claim 52 has been amended to recite: “storing the echo parameters for the one or more minor echoes in a memory, wherein the echo parameters are usable to remove at least a portion of said one or more minor echoes from the input signal”. Similarly, Claim 54 has been amended to recite, “wherein a final state of the second list is usable to remove at least a portion of the minor echoes from the input signal”. Thus, the 101 rejections of claim 52-56 are rendered moot.

### Art-Based Rejections

Claims 1-4, 9, 11-13, 16, 17 and 49-51 were rejected under 35 U.S.C. Section 103(a) as being unpatentable over Limberg et al. (U.S. Publication No. 2002/0051087) (hereinafter “Limberg”) in view of Pham (U.S. Publication No. 2002/0191779).

Claims 38 and 39 were rejected under 35 U.S.C. Section 103(a) as being unpatentable over Chaffee et al. (USPN 5,117,418) (hereinafter “Chaffee”) in view of Pham.

Claim 43 was rejected under 35 U.S.C. Section 103(a) as being unpatentable over Chaffee and Pham, further in view of what the Examiner deems to be “Applicant’s admitted prior art”.

Claim 10 was rejected under 35 U.S.C. Section 103(a) as being unpatentable over Limberg and Pham, further in view of what the Examiner deems to be “Applicant’s admitted prior art”.

Applicant disagrees with these rejections based on the following reasoning.

Claim 1 recites in pertinent part:

“identifying the one or more minor echoes from a filtered **autocorrelation** function of the input signal in response to a determination that there is only one major echo;  
identifying the one or more minor echoes from a filtered **power spectrum** of the input signal in response to a determination that there is more than one major echo ...”. [*Emphasis Added*]

This combination of features is never disclosed in the cited references. The Examiner relies on Limberg as evidence for the anticipation of this combination. In particular, the Examiner points to Limberg paragraph 59, paragraph 72, Figure 5 (items 35, 43) and Figure 6 (item 52). These paragraphs and Figures contain absolutely no disclosure regarding the autocorrelation function or power spectrum in the senses used by the Applicant. Thus, they could not possibly anticipate the recited combination from Claim 1.

By use of the term “autocorrelation function”, Applicant has in mind a function that reports similarity of a given signal with delayed versions of itself. Note that the

autocorrelation mentioned by Limberg at places such as Figure 6 and paragraph 72 is really a cross-correlation between received signal information and a known training sequence (PN1023), as evidenced by Limberg paragraph 77:

“The PN1023 auto-correlation match filter 52 is a finite-impulse-response (FIR) digital filter, with kernel coefficients corresponding to the PN1023. That is, presuming the sample rate to be a multiple of the baud rate, the kernel coefficient is +1 for samples occurring during a modulation level of +5 in a particular phase of the PN1023 sequence and is -1 for samples occurring during a modulation level of -5 in that particular phase of the PN1023 sequence. Accordingly, the PN1023 auto-correlation match filter 52 can be constructed from a chain of clocked digital adders and subtractors, presuming the sample rate to be a multiple of the baud rate. If the sample rate is not a multiple of the baud rate, the match filter will require digital multipliers in its construction. The weighting coefficients are defined by the particular phase of the PN1023 sequence subjected to raised-root-cosine lowpass filtering with roll-off at 5.38 MHz.” *[Emphasis added]*

Limberg never suggests use of an autocorrelation function to identify echoes.

By use of the term “power spectrum”, Applicant means a spectrum that reports the square magnitude of a given complex spectrum. Note that Limberg never suggests use of a power spectrum to identify echoes. The circuitry 44-49 in Limberg Figure 5 is configured to compute a cross-cepstrum between the received (and therefore noisy) input signal and the known training sequence (PN1023), as evidenced by Limberg paragraph 59:

“A read-only memory 47 serially generates samples of the logarithm of an ideal DFT power spectrum for the transmission channel and supplies those logarithmic samples to the subtractor 46 as its minuend input signal. The ideal DFT power spectrum for the transmission channel that is stored in the ROM 47 corresponds with the results of a lowpass filtering of the power spectrum for the PN1023 sequence as resamples to contain the same number of samples that is an integral power of two as in the resampled response to the signal that the gating circuitry 43 selects. The lowpass filtering is done with an ideal lowpass filter characteristic having a Nyquist slope roll-off that minimizes intersymbol interference.” *[Emphasis added]*

Limberg never suggest use of a power spectrum to identify echoes.

Thus, Claim 1 and its dependents are patentably distinguished over the cited references at least for the reasons given above.

Claims 18, 19, 49, 50 and 51 each recite features similar to the features recited in Claim 1. Thus, these claims and their dependents are patentably distinguished over the cited references based at least on the reasoning given above.

Claim 38 recites in pertinent part: “filtering the third stream of power spectra to obtain a ~~fourth~~ filtered stream of ~~filtered~~ power spectra”. Applicant has amended the language of this clause (as indicated) to highlight that a filtering with respect to the stream succession is being claimed. None of the cited references discloses this feature. The Examiner relies on Chaffee Column 5, lines 66-68 as evidence for the anticipation of this feature. These lines from Chaffee read as follows: “The filter coefficients are multiplied by the corresponding transformed signal frequency components at 16 to generate estimated echo coefficients 17.” Note that the inputs to multiplier 16 are “filter coefficients” and “transformed signal frequency components”. (Refer to Chaffee Figure 1 to make sense of the item references.) There is no suggestion of a stream of **power spectra** being provided. Thus, there is no sense in which these lines of Chaffee can be construed as teaching the filtering of a stream of power spectra.

Thus, Claim 38 and its dependents are patentably distinguished over the cited references based at least on the reasoning given above.

## **CONCLUSION**

Applicant submits the application is in condition for allowance, and an early notice to that effect is requested.

If any extensions of time (under 37 C.F.R. § 1.136) are necessary to prevent the above-referenced application(s) from becoming abandoned, Applicant(s) hereby petition for such extensions. The Commissioner is hereby authorized to charge any fees which may be required or credit any overpayment to Meyertons, Hood, Kivlin, Kowert & Goetzel P.C., Deposit Account No. 50-1505/5860-00201/JCH.

Also filed herewith are the following items:

- ☐ Request for Continued Examination
- ☐ Terminal Disclaimer
- ☐ Notice of Change of Address
- ☐ Other:

Respectfully submitted,

/Mark K. Brightwell/

Mark K. Brightwell, Reg. #47446  
AGENT FOR APPLICANT(S)

Meyertons, Hood, Kivlin, Kowert & Goetzel PC  
P.O. Box 398  
Austin, TX 78767-0398  
Phone: (512) 853-8800  
Date: April 16, 2007 MKB